

# **National Center for Computational Sciences Snapshot**

## **The Week of February 4, 2008**

### **Congressman Zach Wamp Visits Oak Ridge**

*Congratulates researchers for IPCC, Nobel effort*

Congressman Zach Wamp recently returned home to his district and paid a visit to Oak Ridge National Laboratory (ORNL), where he recognized five ORNL researchers for their contributions to climate science.

Tom Wilbanks, David Greene, David Erickson, Paul Hanson, and Virginia Dale were each recognized by Wamp in a speech at the National Center for Computational Sciences' (NCCS) EVEREST visualization facility. Their work, performed on an NCCS supercomputer dubbed Cheetah, was responsible for roughly one-third of the data submitted by the U.N.'s Intergovernmental Panel on Climate Change, which shared the Nobel Prize with former Vice President Al Gore.

Climate change is "one of the largest issues facing the world," said Wamp, adding that "people are counting on the United States of America" to be leaders in this, and other, efforts. Furthermore, said Wamp, it is crucial for legislators to have the best research and information available when making policy decisions, alluding to the award-winning effort of the ORNL researchers.

"With one fell swoop you have advanced the cause of Oak Ridge National Laboratory well into the future," Wamp added. Prior to coming to Oak Ridge, Wamp formally recognized the researchers on the floor of the House.

"Computational facilities are doing new things in climate science that were impossible five or ten years ago," said David Erickson, one of the researchers recognized by Wamp. Erickson added that the models used on this most recent effort will only continue to improve, further providing policymakers with the tools they need to assess a changing climate.

### **ORNL Researchers Team Up with the NFL for a Carbon-Neutral Super Bowl**

*Laboratory helps quantify carbon footprint of Super Bowl*

Is it possible to have a carbon-neutral Super Bowl? When National Football League (NFL) Environmental Program Coordinator Jack Groh wanted to find out, he called Oak Ridge National Laboratory. There, he teamed up with Corporate Fellow David L. Greene and recently retired senior research engineer John Tomlinson, both of the Engineering Science and Technology Division, to calculate how much carbon the sporting event is responsible for.

Lighting and heating the venue, NFL-organized fan events including exhibits, interviews, and games, and NFL-arranged transportation, such as buses and limos, to and from the

University of Phoenix Stadium—all are activities that generate carbon. The carbon comes from fossil fuels burned to generate electricity and operate motor vehicles. The scientists concluded Super Bowl XLII would be responsible for the emission of about a million pounds of carbon.

Charged with evaluating environmental impacts of NFL events and developing cost-effective solutions to address them, Groh then worked with Princeton University to come up with a carbon mitigation strategy that included buying green energy from utilities, using biofuels when available, and planting trees to take up carbon when the other methods fell short.

NBC Nightly News came to ORNL on Jan. 28 to cover the story, speaking with Barry Berven at the lab's greenhouse about using trees to sequester carbon and interviewing Greene in the lab's library and at the National Center for Computational Sciences' EVEREST Powerwall, a 30-foot-wide, 8-foot-tall tiled display that can show 35 million pixels of information.

Using data provided by Eddie Bright of ORNL's Geographic Information Science & Technology group, visualization expert Sean Ahern fired up EVEREST, which stands for "Exploratory Visualization Environment for Research in Science and Technology," to display nighttime illumination in the Phoenix area and population distributions around the country associated with the Super Bowl's carbon footprint. EVEREST normally displays data from the nation's top scientists exploring grand challenges in physics, biology, chemistry, astronomy, and beyond.

"What's interesting here is that the NFL took the initiative on its own to do this," Greene said. "No one's forcing them to do this. It's a statement about environmental responsibility."

Carbon's role in the world's climate is a key research focus of ORNL's National Center for Computational Sciences, or NCCS, which hosts one of the nation's most powerful computers for open science research and where simulations are pushing the boundaries of Earth system modeling. More than 15 percent of the NCCS's computer resources will be dedicated to climate studies this year.

NBC's story is available for viewing at <http://video.msn.com/?mkt=en-us&fg=rss&vid=6b533099-b28c-41ef-9cc9-7faa495de1aa&from=34>.

### **New Vis Hardware—See It to Believe It**

*NCCS to replace visualization cluster*

The NCCS is in the process of replacing its aging visualization cluster, a move that will dramatically boost the amount of data users can analyze at the center, the speed at which they can analyze it, and the quality of visualizations they can view.

The Hawk system has been responsible both for data analysis and for powering the center's 240-square-foot EVEREST Powerwall, but it is nearing 5 years old, ancient for a leadership computing system. In the coming months it will be replaced by three separate clusters: Lens, a large-memory 32-node system that will be dedicated to data analysis, Everest, a separate cluster that will be dedicated to operating the 35-million-pixel Powerwall, and Orb, a state-of-the-art Lustre file system dedicated to serving data to the large powerwall.

The heart of the new setup will be Lens, boasting four dual-core AMD Opteron processors, two graphics cards, and 64 gigabytes of memory on each node. Visualization task lead Sean Ahern said he expects Lens to be able to handle datasets 20 times larger than those within Hawk's capabilities and perform the analysis as much as ten times faster.

"Hawk was constraining because there were datasets that we could not analyze on it," Ahern explained, pointing as an example to fusion simulations performed by researchers at the Princeton Plasma Physics Laboratory. "They talk about particles in the trillions; if you want to process all of them, you need something on the order of a couple of terabytes of total memory, which Lens will provide. Having something like this and having a very large file system like Spider [the NCCS-wide Lustre file system] allows us to be able to take some of the timesteps and be able to process all of the data, looking at the individual data points and generating accurate statistical trends."

Ahern noted that several other of the center's most prominent users had run across similar constraints with Hawk and that Lens would be especially welcome by researchers analyzing climate change, core-collapse supernovas, and combustion, among other things.

The benefits of the new systems will also be seen on the 30-by-8-foot EVEREST Powerwall screen.

"With Everest and Orb, it will be possible to show movies across the entire wall at 30 frames per second," Ahern noted, "compared to two frames per second possible with the current setup."

Ahern noted that many of the new components are already on site and being set up. He estimated that the changeover will be complete within the next couple of months.